mobile knows the location of this bit and looks for this power control bit at that location. As an example, a "0", bit instructs the mobile to increase its mean output power level a predetermined amount and a "1" bit instructs the mobile to decrease its mean output level a predetermined amount.

The code division channel selection generator **(201)** is coupled to a combiner **(202)** and provides a particular Walsh symbol to the combiner **(202)**. The generator **(201)** provides one of 64 orthogonal codes corresponding to 64 Walsh symbols from a 64 by 64 Hadamard matrix wherein a Walsh symbol is a single row or column of the matrix. The combiner **(202)** uses the particular Walsh code input by the code division channel generator **(201)** to spread the input scrambled data symbols into Walsh code spread data symbols. The Walsh code spread data symbols are output from the XOR combiner **(202)** and into the quadrature spreading combiners at a fixed chip rate of 1.2288 Mchp/s.

In the previously described system, as the mobile's transmission bit rate is reduced, it is desirable to reduce the average transmitter power accordingly. The mobile, therefore, reduces its transmit power, by reducing its transmitter duty cycle, as the data rate decreases. This permits the base station to measure the mobile's received signal to noise ratio (SNR) in each 1.25 ms. interval of six Walsh symbols, also known in the art as a power control group, and comparing this with a constant standard without the need to know the actual transmission rate being utilized in each data frame.

Each 20 ms. long data frame is comprised of 16 power control groups. Co-pending patent application U.S. Ser. No. 07/822,164 to Padovani et al. and assigned to Qualcomm, Inc. recites a more detailed explanation of the 20 ms frames that are transmitted on the forward and reverse channels. The amount of data transmitted in each frame depends on the data rate. The frame composition for each data rate for the forward and reverse channels is illustrated in the following table:

Raw # bits	CRC	Tail	Rsrvd	Info bit	Rate
288	12	8	3	265	13250
144	10	8	2	124	6200
72	8	8	2	54	2700
36	6	8	2	20	1000

The rate listed in the table is the information bit rate. The reserved bits for the forward and reverse channels, in the preferred embodiment, are for signaling, power control, and future use.

During each power control group that the mobile is transmitting, it transmits at a power level determined by the power control system of the base station. The base station measures the received SNR of each received mobile signal during the 1.25 ms. power control interval and compares it to a target SNR established for that particular mobile. If the SNR exceeds the target SNR, a "turn down" command is transmitted from the base station to the mobile. Otherwise a "turn up" command is sent.

These power control commands are transmitted to the mobile by puncturing the data transmission with the power control bit. This puncturing replaces a data bit with the power control bit. The receiving mobile typically responds to a turn down command by reducing its transmitter power by 1 dB and increases its power by 1 dB in response to a turn up command.

The disadvantage of the above described power control scheme is that the mobile transmitter signal is pulsed on and off when transmitting at less than the maximum data rate. While the system performs adequately with this scheme, it may cause interference to other electronic systems, such as hearing aids. The European radiotelephone system, Global System for Mobile communications, uses this power control scheme and exhibits such behavior. There is a resulting need for a power control scheme that enables the mobile to operate using a 100% duty cycle while providing fast and accurate closed loop power control from the base station to the mobile.

SUMMARY OF THE INVENTION

The process of the present invention enables a radiotelephone's transmitter to operate at a 100% duty cycle. The transmitted power is varied according to the bit transmission rate used in each 20 ms data transmission frame so as to transmit a constant energy for each information bit. The base station, not knowing the transmission rate in advance, maintains a table of SNR threshold values for each possible data rate that the radiotelephone might use. The base station then compares the SNR of the received signal to the threshold values and generates a different power control command for each SNR versus SNR threshold comparison. The base station transmits these commands to the radiotelephone. The radiotelephone, knowing the rate at which the data was transmitted, chooses the power control command corresponding to that data rate.

BRIEF DESCRIPTION OF TIE DRAWINGS

FIG. **1** shows a block diagram of a typical prior art CDMA reverse link transmitter for use in a radiotelephone system.

FIG. **2** shows a block diagram of a typical prior art CDMA forward link transmitter for use in a radiotelephone system.

FIG. **3** shows a flowchart of the power control process of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The process of the present invention provides power control of a mobile radiotelephone transmitter over the forward channel while allowing the mobile to transmit using a 100% duty cycle. This is accomplished by the mobile varying the transmit power for each frame according to the bit transmission rate and the base station monitoring the SNR of the transmitted signals and instructing the mobile to change its power accordingly.

The closed loop power control process of the present invention, illustrated in the flowchart of FIG. **3**, begins by the mobile transmitting a signal **(301)** formatted into the frames of data described above. The transmitter is operating at a 100% duty cycle but varies the transmit power of each frame according to the frame's transmission rate.

In the preferred embodiment, the mobile has a variable rate vocoder that operates at 9600, 4800, 2400, and 1200 bits/second (bps). At the 4800 bps rate, the mobile's transmitter power starts out at a power output that is reduced 3 dB from that used at the 9600 bps rate. The 2400 bps rate starts at a power output 6 dB less than the 9600 bps rate and the 1200 bps rate starts at a power output that is 9 dB less. These initial power settings are then varied in subsequent frames by the process of the present invention.

The base station cannot determine the data rate of a 20 ms data frame until well after the completion of the frame due to the forward error detection and correction coding (FEC) used. Therefore, when the base station receives a data frame